STRATOSPHERIC STABILITY OF A PROBE DESCENDING UNDER PARACHUTE
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ABSTRACT

Much of what we know about extraterrestrial atmospheres is learned by probes traveling through a planet's atmosphere with sensors on board for external measurements. Understanding the atmosphere is hindered by the dynamics of the probe during descent. In order to create a more accurate atmospheric profile the dynamic behavior of entry probes needs to be fully understood. To build a baseline understanding of probe behavior NASA's Jet Propulsion Laboratory (JPL) funded a student run program at the University of Idaho in a mission to monitor the behavior of a small probe as it descends under a cross-parachute from a height of 90,000 feet.

A spherical probe was designed and built out of a Kevlar composite, and houses an original wireless nodal network communication system, a nadir-pointed imaging system, a dual redundancy tracking system, and a sensor package. A cut-down system was designed and built to separate the probe from the balloon on command from the flight team. Probe instrumentation includes five sensors to fully characterize the descent dynamics, reconstruct the trajectory, and take measurements of atmospheric composition. Flight instrumentation includes pressure and temperature sensors, a magnetometer, a 3-axis gyroscope, and a 3-axis accelerometer.

The system test plan consists of two flights. The goal of the first flight in Spring, 2009 was to test the integration and operation of new systems while using previously proven systems as a backbone. It included the final design of imaging, sensor data acquisition system, as well as a proof-of-technology test for some tracking components. The second flight, scheduled for flight in early 2010, will implement improvements from the first flight, include a test of the cutdown system, and measure the probe descent dynamics and atmospheric structure from the cutdown at 90,000 feet. Success in this mission will provide useful data on probe dynamics to JPL and may garner support for funding of future university missions.